Map Reading/Land Navigation Reinforcement Training Package (RTP)

Purpose

This Reinforcement Training Package (RTP) provides the student with a standardized plan for the reinforcement training of the navigational tasks in STP 21-1-SMCT.

This RTP Contains

Performance Measures	GO	NO GO
3. Moved passed a building opening (window or open door).	— —	— —
4. Moved around a corner.	— —	— —
5. Crossed a wall.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-06 and FM 3-21.75 (FM 21-75)

071-329-1000
Identify Topographic Symbols on a Military Map

Conditions: Given a 1:50,000-scale military map and a requirement to identify topographic symbols on the map.

Standards: Identify topographic symbols, colors, and marginal information on a military map.

Performance Steps

1. Identify the six basic colors on a military map (figure 071-329-1000-1).

COLORS	SYMBOLS
Black	Cultural (man-made) features other than roads
Blue	Water
Brown	All relief features - contour lines on old maps - cultivated land on red-light readable maps
Green	Vegetation
Red	Major roads, built-up areas, special features on old maps
Red-brown	All relief features and main roads on red-light readable maps

Figure 071-329-1000-1. Colors

   a. Identify the features that the color black represents.

Note: Indicates cultural (manmade) features such as buildings and roads, surveyed spot elevations, and all labels.

   b. Identify the features that the color blue represents.

Note: Indicates hydrography or water features such as lakes, swamps, rivers, and drainage.

   c. Identify the features that the color green represents.

Note: Indicates vegetation with military significance such as woods, orchards, and vineyards.

   d. Identify the features that the color brown represents.

Note: Brown identifies all relief features and elevation such as contours on older edition maps and cultivated land on red light readable maps.

e. Identify the features that the color red represents.

Note: Classifies cultural features, such as populated areas, main roads, and boundaries on older maps.

f. Identify the features that the color red-brown represents.

Note: These colors are combined to identify cultural features, all relief features, non-surveyed spot elevations, and elevation such as contour lines on red light readable maps.

g. Identify all other features and the colors they represent, if applicable.

Note: Other colors may be used to show special information. These are indicated in the marginal information as a rule.

2. Identify the symbols on the map (figure 071-329-1000-2).

FEATURES	COLORS	DESCRIPTION
Drainage	Blue	These symbols include lakes, streams, rivers, marshes, swamps, and coastal waters.
Relief	Brown	These features are normally shown by contour lines, intermediate contour lines, and form lines. In addition to contour lines, there are relief symbols to show cuts, levees, sand, sand dunes, ice fields, strip mines, and glaciers.
Vegetation	Green	These symbols include woods, scrub, orchards, vineyards, tropical grass, mangrove and marshy areas, or tundra.
Roads	Red, Black, or Red-brown	These symbols show hard-surface, heavy-duty roads; hard surface, medium-duty roads; improved light-duty roads; unimproved dirt roads; and trails. On foreign road maps, symbols may differ slightly; check the map legend for proper identification of roads.
Railroads	Black	These symbols show single-track railroads in operation; single-track railroads not in operation; double- or multiple-track railroads.
Buildings	Black, Yellow, Red, or Pink	These symbols show built-up areas, schools, churches, ruins, lighthouses, windmills, and cemeteries.

Figure 071-329-1000-2. Symbols

a. Use the legend, which should identify most of the symbols used on the map.

b. Identify each object by its shape on the map.

Note: For example, a black, solid square represents a building or a house; a round or irregular blue item is a lake or pond.

c. Use logic and color to identify each map feature.

Note: For example, blue represents water. If you see a symbol that is blue and has clumps of grass, this would be a swamp.

3. Identify the marginal information (figure 071-329-1000-3).

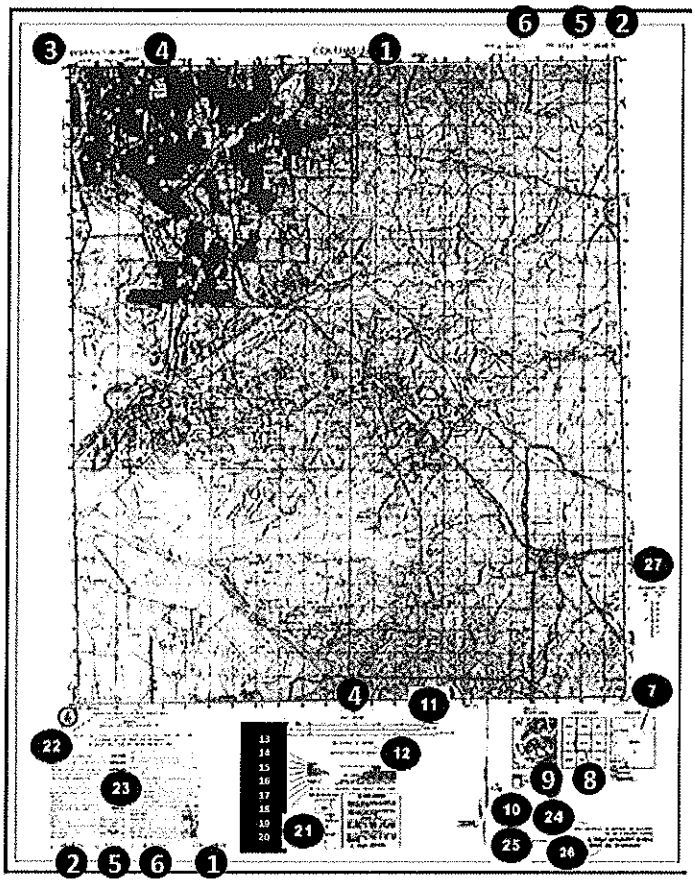


Figure 071-329-1000-3. Topographical map

a. Identify the sheet name (1).
b. Identify the sheet number (2).
c. Identify the series name (3).
d. Identify the scale (4).
e. Identify the series number (5).
f. Identify the edition number (6).
g. Identify the index to boundaries (7).
h. Identify the adjoining sheets diagram (8).
i. Identify the elevation guide (9).
j. Identify the declination diagram (10).
k. Identify the bar scales (11).
l. Identify the contour interval note (12).
m. Identify the spheroid note (13).
n. Identify the grid note (14).
o. Identify the projection note (15).
p. Identify the vertical datum note (16).
q. Identify the horizontal datum note (17).
r. Identify the control note (18).
s. Identify the preparation note (19).

Performance Steps

t. Identify the printing note (20).
u. Identify the grid reference box (21).
v. Identify the unit imprint and symbol (22).
w. Identify the legend (23).

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him/her by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Identified the six basic colors on a military map.	— —	— —
2. Identified the symbols on a military map.	— —	— —
3. Identified the marginal information on a military map.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).
References
Required:
Related: FM 3-25.26

071-329-1001
Identify Terrain Features on a Map

Conditions: Given a 1:50,000-scale military map and a requirement to identify terrain features on the map.
Standards: Identify the five major and the three minor terrain features on a military map.

Performance Steps

1. Detect targets.

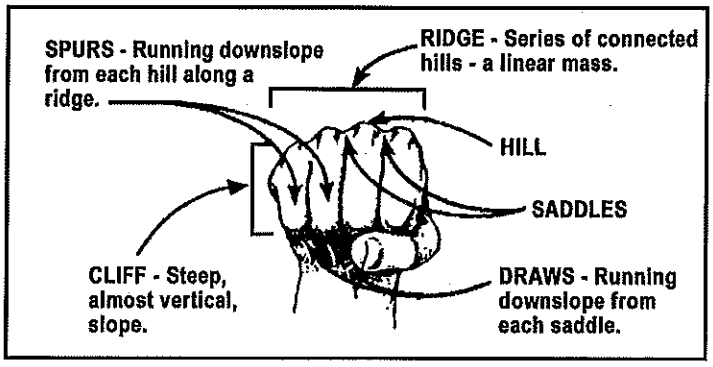
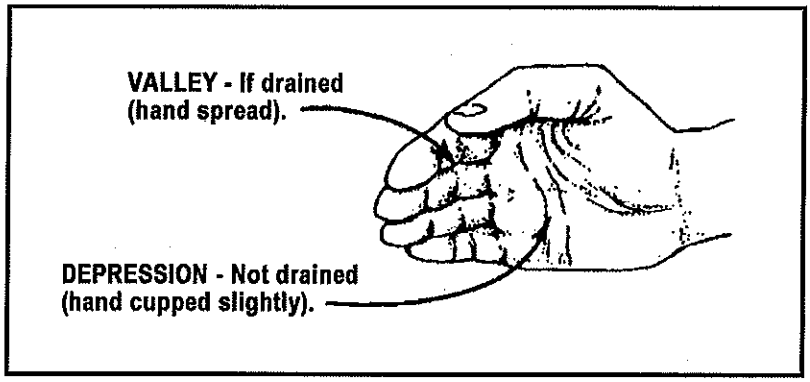


Figure 071-329-1001-1. Using fist to explain terrain features



071-329-1001-2. Using hand to explain terrain features

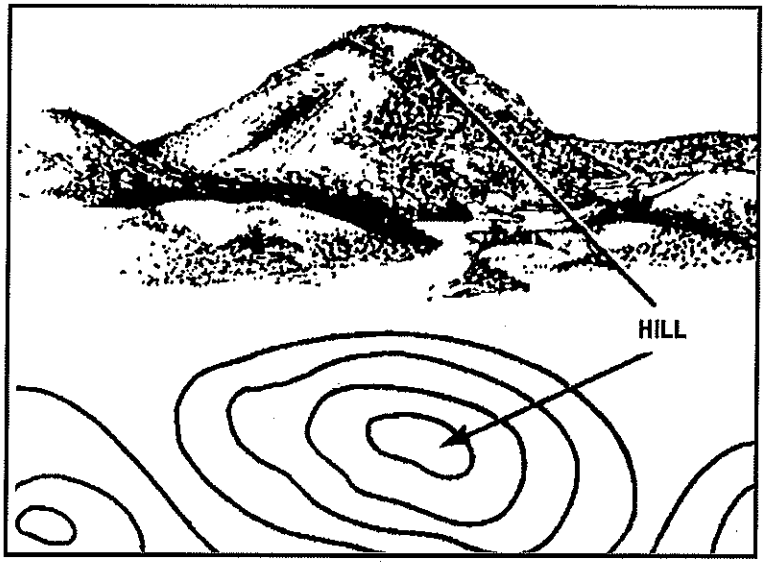


Figure 071-329-1001-3. A hill

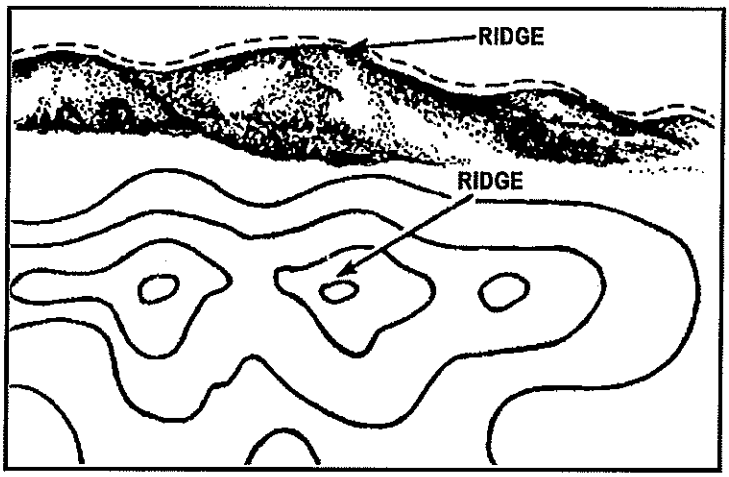


Figure 071-329-1001-4. A Ridge

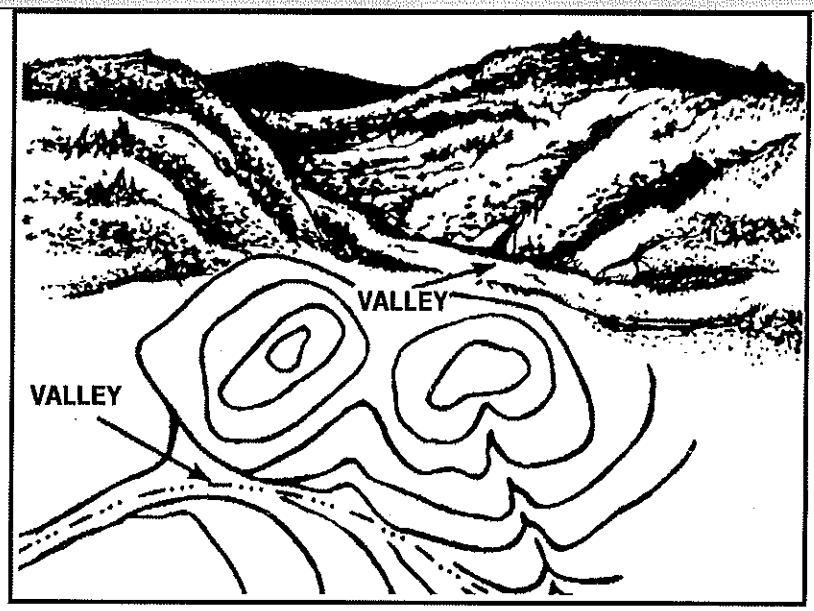


Figure 071-329-1001-5. A valley

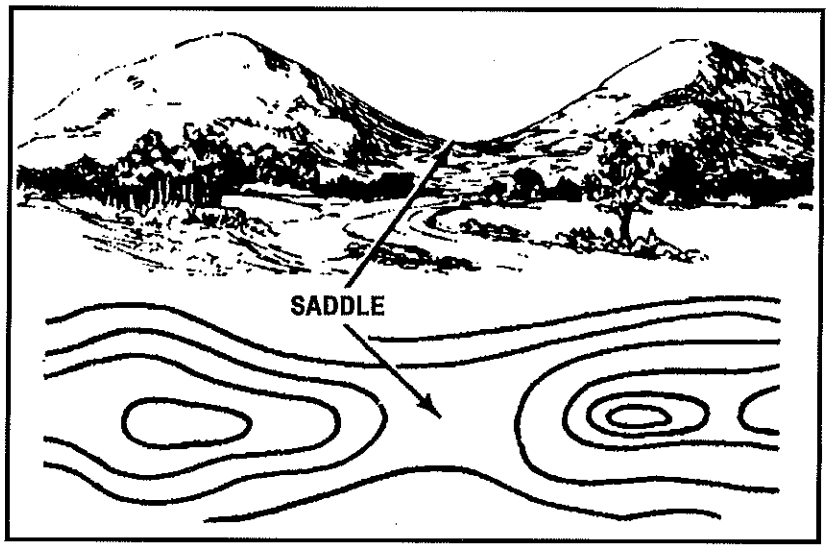


Figure 071-329-1001-6. A saddle

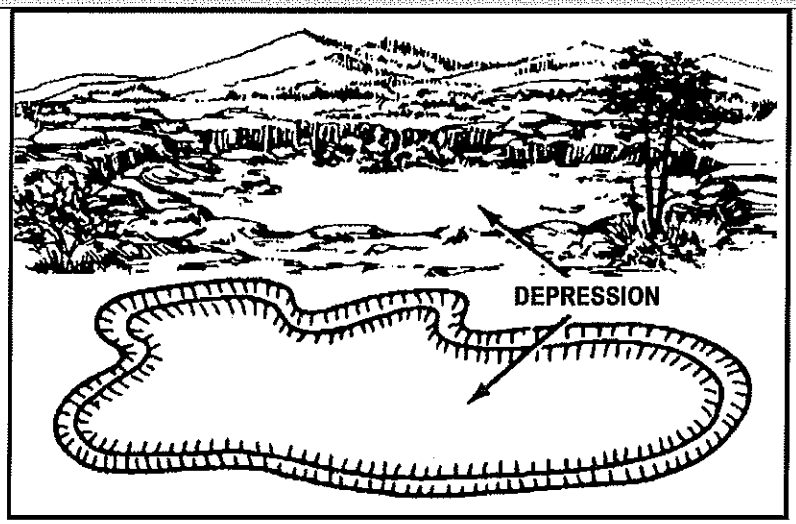


Figure 071-329-1001-7. A depression

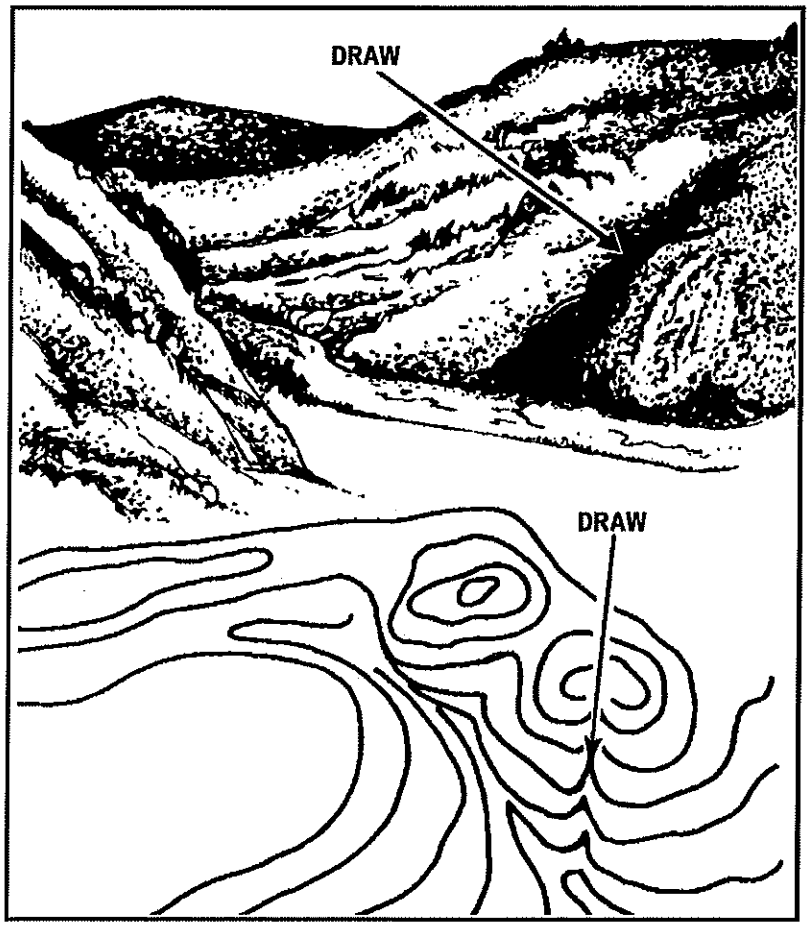


Figure 071-329-1001-8. A draw

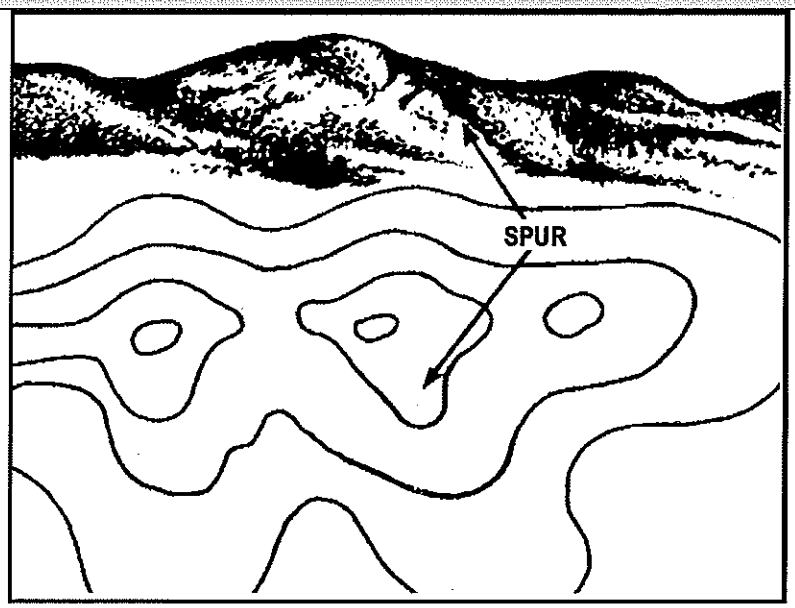


Figure 071-329-1001-9. A spur

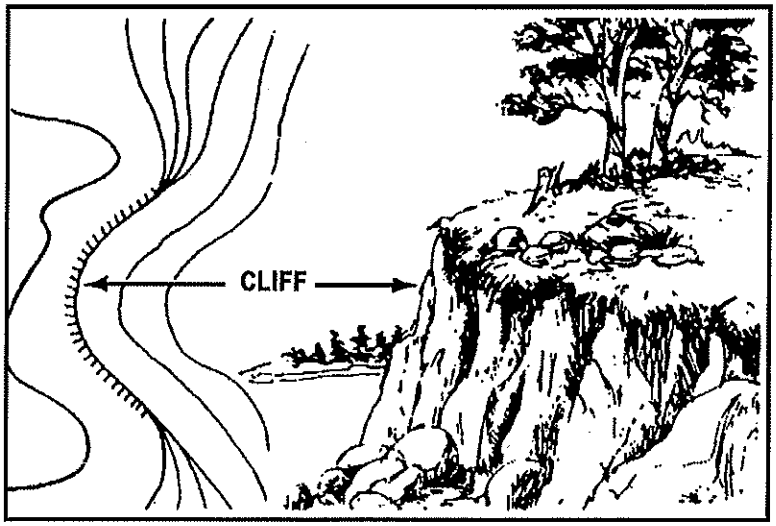


Figure 071-329-1001-10. A cliff

Table 071-329-1001-1

FEATURE	CHARACTERISTICS	MAP SYMBOL
Hill Figure 3 Major	A point or small area of high ground from which the ground slopes down in all directions.	Contour lines forming concentric circles.
Ridge Figure 4 Major	A line of high ground with height variations along its crest.	Contour lines forming a U or V; closed end points away from high ground.
Valley Figure 5 Major	Reasonably level ground bordered on the sides by higher ground. Generally has maneuver room. Contains a stream.	Contour lines form U. Lines tend to parallel stream before crossing. Contour line crossing a stream always points upstream.
Saddle Figure 6 Major	A dip/low point along a ridge crest; either lower ground between two hill tops or a break in the level crest.	A saddle is normally represented as an hourglass.
Depression Figure 7 Major	Low point or hole in the ground with higher ground on sides.	Closed contour lines that have tick marks pointing toward low ground.
Draw Figure 8 Minor	Like a valley, but normally has less developed stream course. No level ground and little or no maneuver room. Ground slopes upward on the sides and toward the head of the draw.	Contour lines are V-shaped with the point of the V toward the head of the draw (high ground).
Spur Figure 9 Minor	Short, continuously sloping line of higher ground jutting out the side of a ridge. Often formed by parallel streams cutting draws down a ridge.	Contour lines depict a spur with the U or V pointing away from high ground.
Cliff Figure 10 Minor	A vertical or near vertical slope.	Contour lines are close together or a ticked or "carrying" contour line (ticks point to lower ground).

Performance Steps

a. Identify a hill (figure 071-329-1001-11).

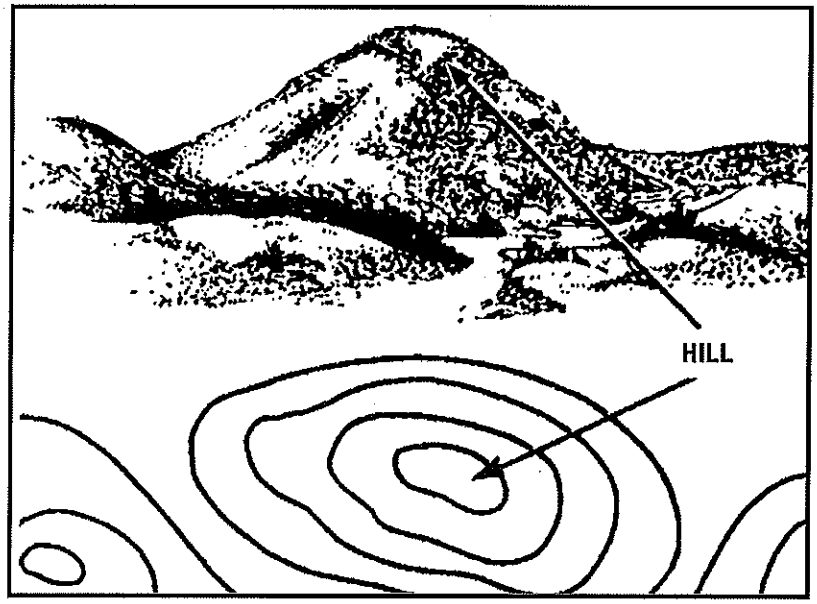


Figure 071-329-1001-11. Hill

b. Identify a saddle (figure 071-329-1001-12).

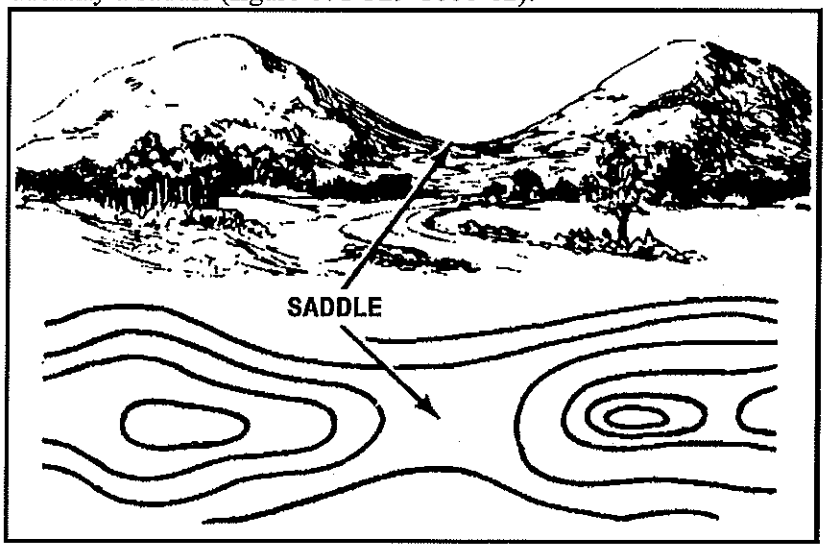


Figure 071-329-1001-12. Saddle

c. Identify a valley (figure 071-329-1001-13).

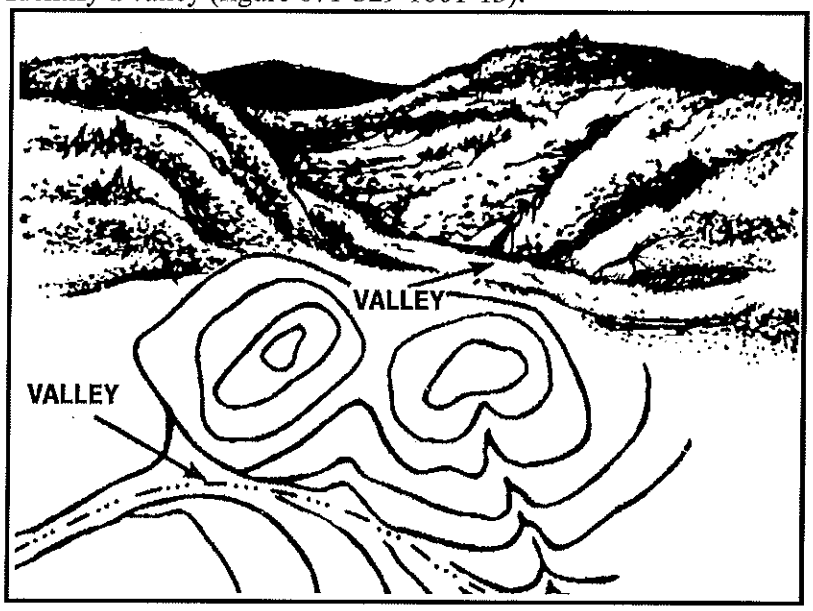


Figure 071-329-1001-13. Valley

d. Identify a ridge (figure 071-329-1001-14).

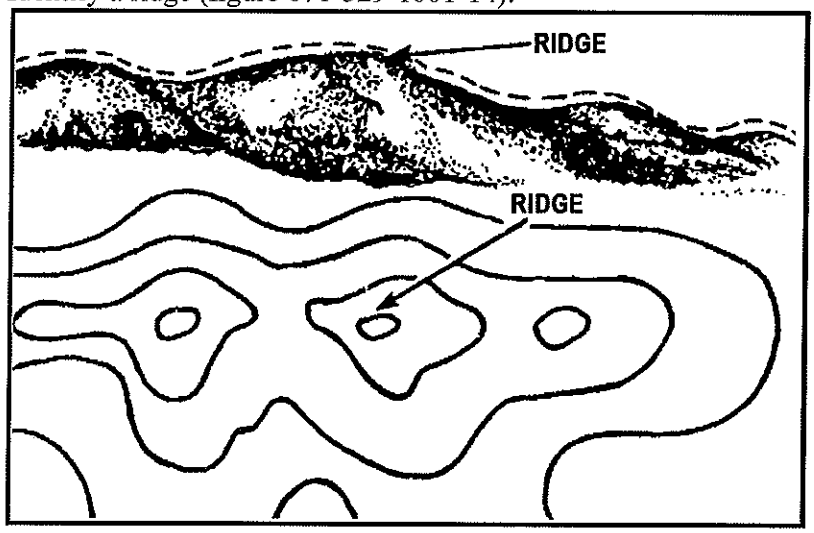


Figure 071-329-1001-14. Ridge

e. Identify a depression (figure 071-329-1001-15).

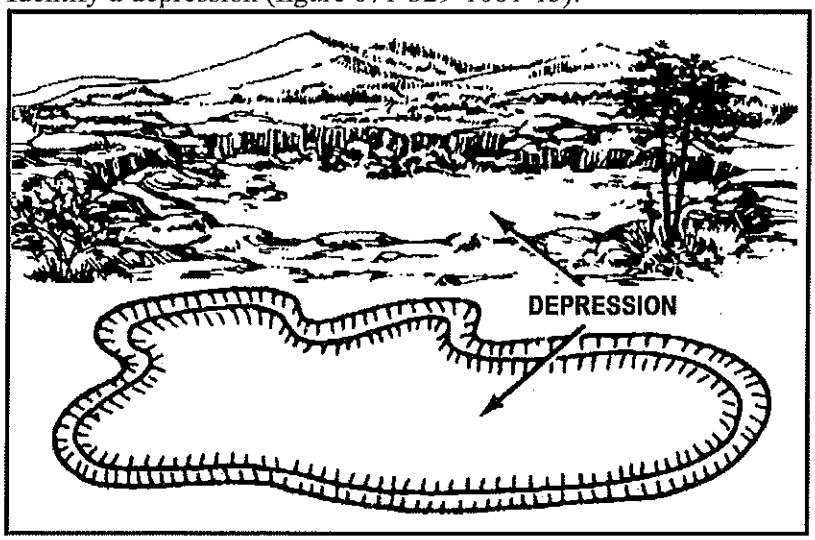


Figure 071-329-1001-15. Depression

2. Identify three minor terrain features.
   a. Identify a draw (figure 071-329-1001-16).

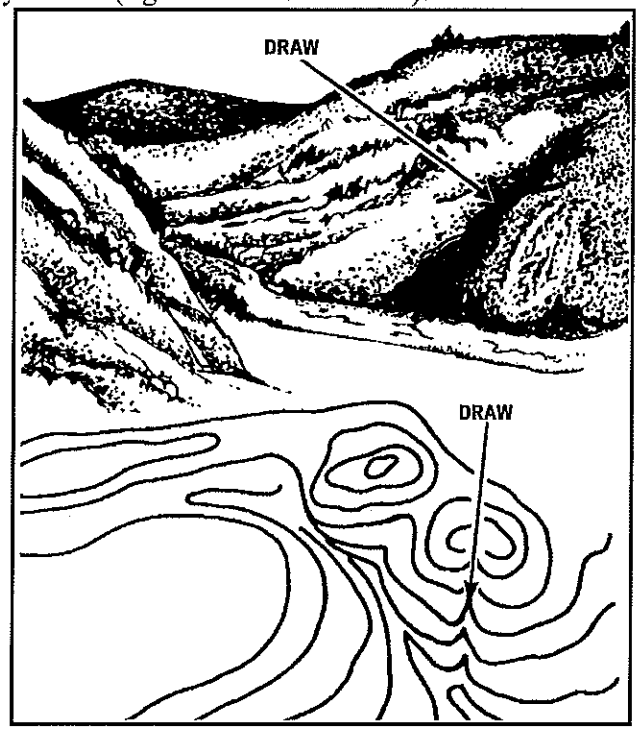


Figure 071-329-1001-16. Draw

Performance Steps

b. Identify a spur (figure 071-329-1001-17).

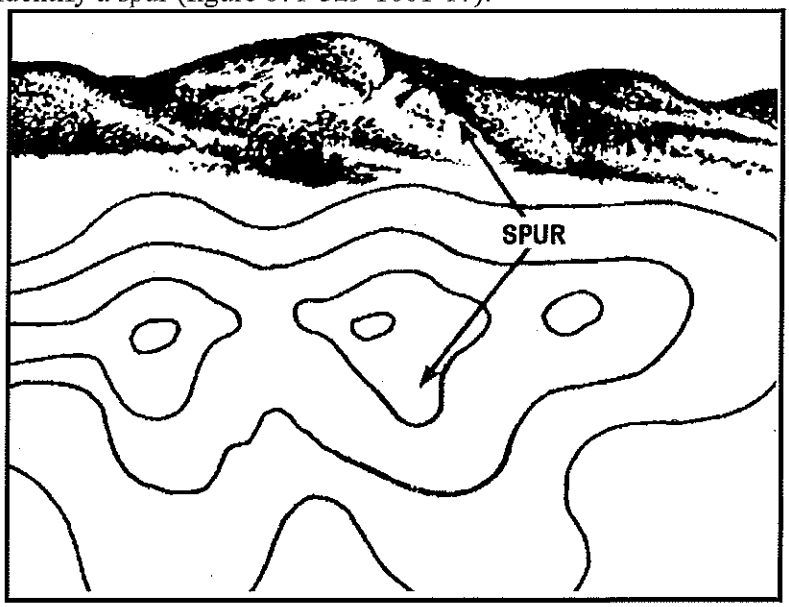


Figure 071-329-1001-17. Spur

c. Identify a cliff (figure 071-329-1001-18).

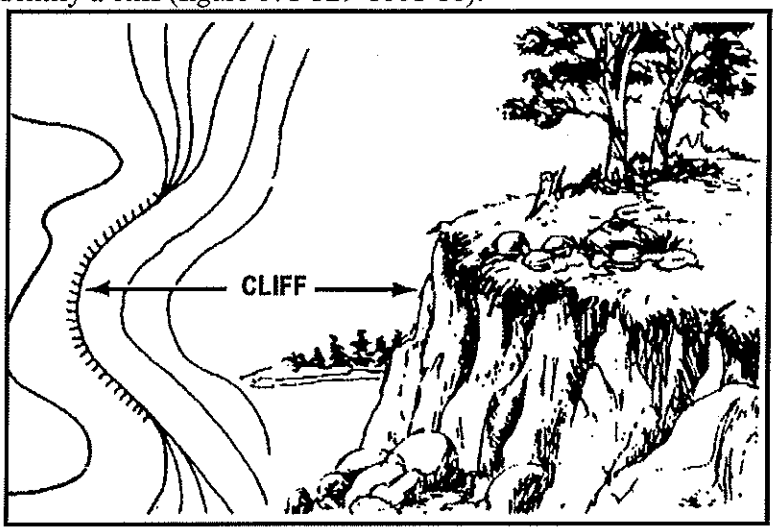


Figure 071-329-1001-18. Cliff

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him/her by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Identified the five major terrain features.	— —	— —
2. Identified the three minor terrain features.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26

Performance Steps

g. Determine if the end-point falls within the bar scale.

(1) Record the value on the scale of the end-point if the end-point fits on the scale.

(2) Add 4,000 meters to this value (a) to get the total difference.

h. Determine if the end-point falls outside the bar.

(1) Repeat steps 5d and 5e until the end-point falls within the bar.

(2) Add 4,000 meters to the value you derived in step 5g(1) for each time you performed step 5d to achieve the total distance.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Identified the scale of the map.	— —	— —
2. Converted a straight-line map distance to miles, meters, or yards using the map's bar scale for map distances equal to or less than 1 inch.	— —	— —
3. Converted a straight-line map distance to miles, meters, or yards using the map's bar scale for map distances greater than 1 inch.	— —	— —
4. Converted a road map distance to miles, meters, or yards using the map's bar scale for distances equal to or less than 1 inch.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26

071-329-1002
Determine the Grid Coordinates of a Point on a Military Map

Conditions: Given a 1:50,000-scale military map, a 1:50,000 grid coordinate scale, a pencil, paper, and a point on the map with a requirement to determine the grid coordinates.

Standards: Determine the coordinates of the grid square, determine coordinates using coordinate scale and without use of coordinate scale. Add the two-letter 100,000 meter square identifier to determine grid coordinate.

Performance Steps

1. Determine the coordinates of the grid square (figure 071-329-1002-1).

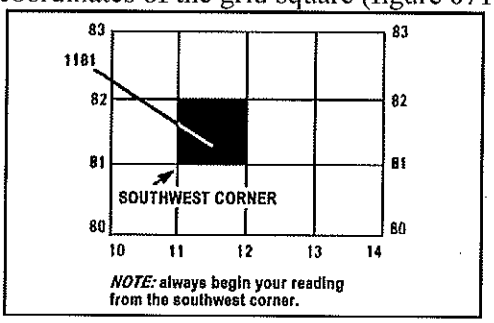


Figure 071-329-1002-1. Identifying the grid square

a. Select the grid square that contains the identified point on the map (see figure 071-329-1002-1).

b. Read the north-south grid line that precedes the desired point (see figure 071-329-1002-1).

c. Record the number associated with that line.

d. Read the east-west grid line that precedes the desired point (see figure 071-329-1002-1).

e. Record the number associated with that line.

Note: The number of digits represents the degree of precision to which a point has been located and measured on a map the more digits the more precise the measurement. In the above example the four digits 1181 identify the 1,000 meter grid square to be used.

2. Determine point grid coordinates without coordinate scale (figure 071-329-1002-2).

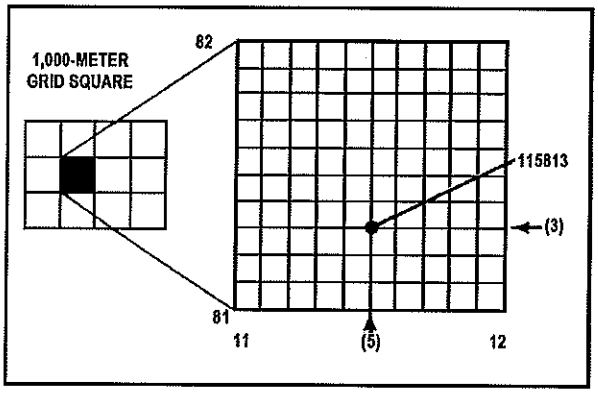


Figure 071-329-1002-2. Grid square 1181 divided

a. Allocate the grid square into a 10 by 10 grid.

b. Read right (from the lower left corner) to the imaginary gird line nearest the identified point.

Note: The north-south imaginary line nearest the point is halfway or 5 lines out of 10 lines. Therefore, the first half of your grid coordinate is 115.

c. Read up (from the point reached in step 3b) to the imaginary grid line nearest the identified point.

Note: The east-west imaginary line nearest the point is one-third of the way up or 3 lines out of 10 lines. Therefore the second half of your grid coordinate is 813.

3. Determine point grid coordinates with coordinate scale (figure 071-329-1002-3).

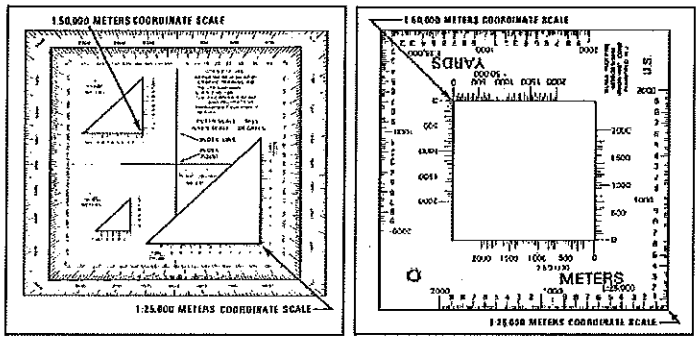


Figure 071-329-1002-3. Coordinate scale and protractor (left) and plotting scale (right)

Note: The most accurate way to determine the coordinates of a point on a map is with a coordinate scale. You need not imagine lines because you can find the exact coordinates using the coordinate scale, protractor, or the plotting scale. Each device, in fact, includes two coordinate scales, 1:25,000 and 1:50,000 meters. Make sure that, regardless which device you use, you choose the correct scale.

a. Locate the grid square where the point is located.

Note: The number of the vertical grid line on the left (west) side of the grid square gives the first and second digits of the coordinate. The number of the horizontal grid line on the bottom (south) side of the grid square gives the fourth and fifth digits of the coordinate.

b. Place a coordinate scale and protractor or a plotting scale (see figure 071-329-1002-3) on the bottom horizontal grid line of the grid square containing Point A to determine the third and sixth digits of the coordinate.

c. Check to see that the zeros of the coordinate scale are in the lower left-hand (southwest) corner of the grid square where Point A is located (figure 071-329-1002-4).

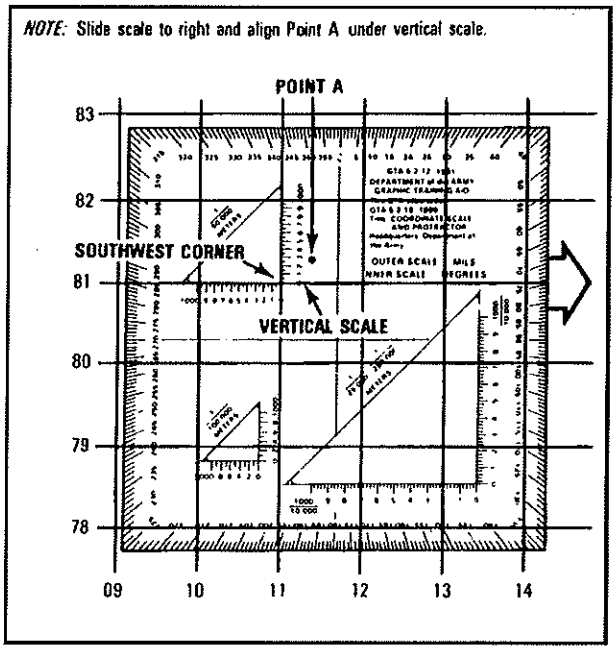


Figure 071-329-1002-4. Placement of the coordinate scale

d. Slide the scale to the right, keeping the bottom of the scale on the bottom grid line until Point A is under the vertical (right-hand) scale (figures 071-329-1002-5 and 071-329-1002-6).

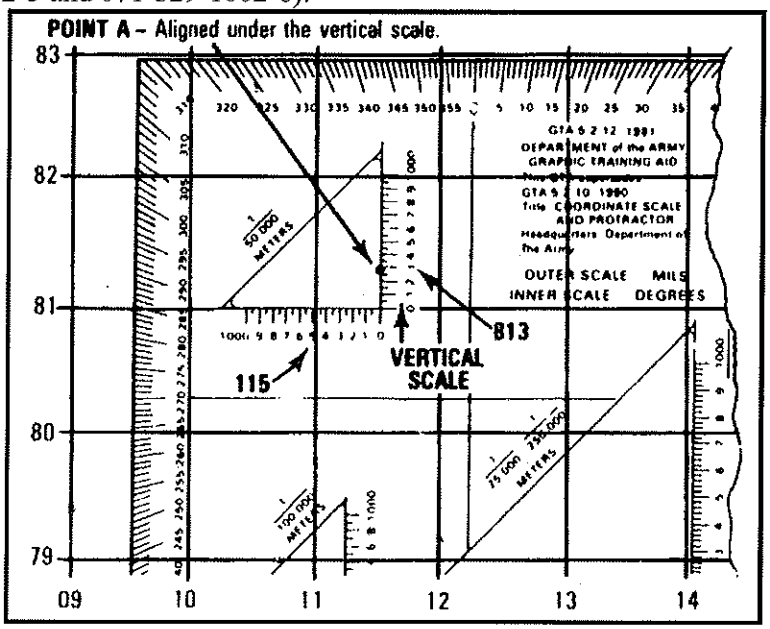


Figure 071-329-1002-5. Aligning the coordinate scale

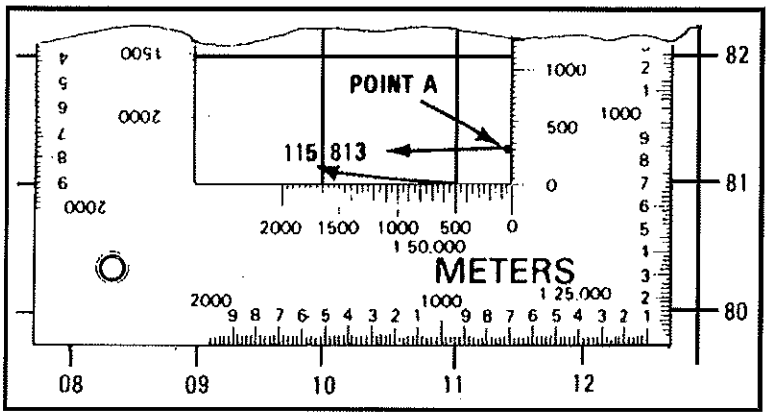


Figure 071-329-1002-6. Aligning the plotting scale

Note: To determine the six-digit coordinate, look at the 100-meter mark on the bottom scale, which is nearest the vertical grid line. This mark is the third digit of the number 115. The 100-meter mark on the vertical scale nearest to Point A gives you the sixth digit of the number 813. The complete grid coordinate is 115813. Always read right, and then up.

4. Add the two-letter 100,000-meter-square identifier to determined grid coordinate.

a. Identify the two-letter 100,000-meter-square identifier by looking at the grid reference box in the margin of the map (figure 071-329-1002-7).

Performance Steps

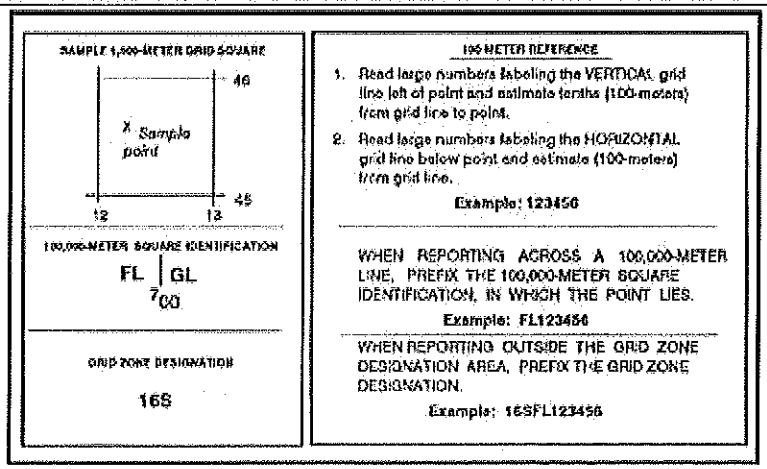


Figure 071-329-1002-7. Grid reference box

b. Place the 100,000-meter-square identifier in front of the grid coordinate.

Note: In the example given the final grid coordinate becomes GL115813.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Determined the coordinates of the grid square.	— —	— —
2. Determined point grid coordinates without coordinate scale.	— —	— —
3. Determined point grid coordinates with coordinate scale.	— —	— —
4. Added the two-letter 100,000-meter-square identifier to the determined grid coordinate.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26 and GTA 05-02-012

QUIZ 1

Quiz 1

Answer the questions below by circling the correct response, filling in the blank, or writing in the space provided. After you finish, check your answers on the Quiz Solution Sheet and study the questions you missed or any other areas you may have questions about.

If you need additional help, review the references or ask your SGL for assistance.

Question 1 What are the six colors used on a military map?

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

Question 2 What do the six colors on a military map represent?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Question 3 What portion of a map explains the symbols and features used, and where can you find it?

_____

Question 4 What information is on the map that will tell you the angular relationships of true north, grid north, and magnetic north?

_____

Question 5 Where on the map will you find the declination diagram?

_____

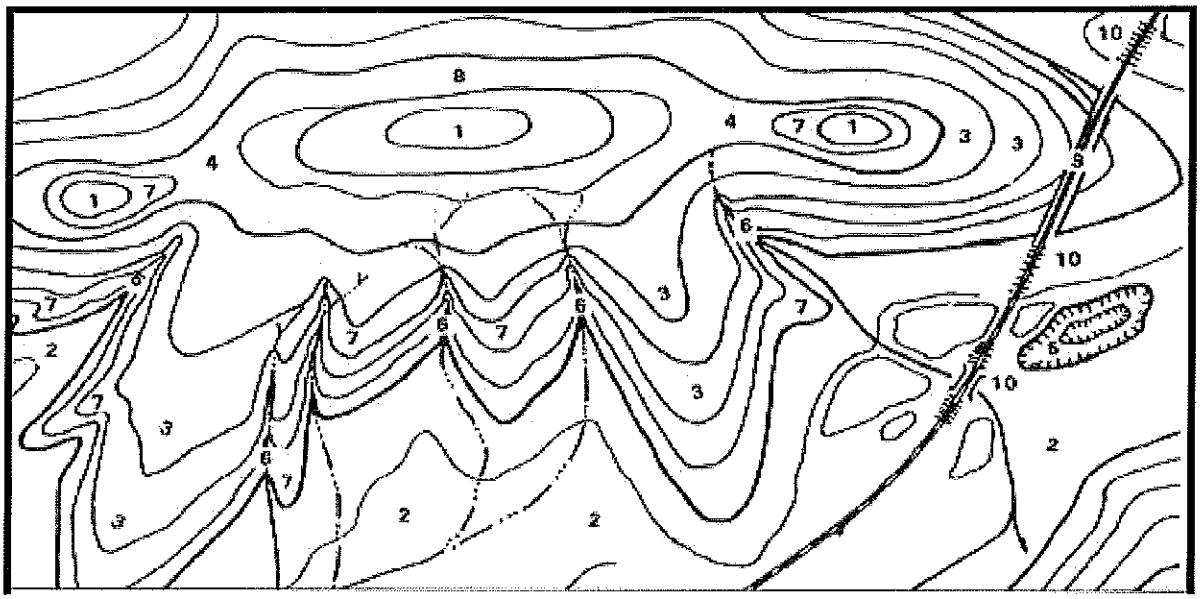
Question 6 The more digits in a coordinate, the _____ _____ the location.

Question 7 Regardless of the scale of a military map, how many meters are normally in a grid square?

Question 8 How do you read a map to find a grid coordinate?

Question 9 How many digits must there be in the grid coordinate of a target to locate the target to within 100 meters?

Question 10 You have just learned 10 basic terrain features. Look at the diagram below and identify the numbered terrain features.



Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Placed the cover side of the compass pointing towards the top of the level map.	— —	— —
2. Aligned the compass parallel to a north-south grid line.	— —	— —
3. Rotated map and compass until the directions of the declination diagram formed by the black index line and the compass needle matched the direction shown in the declination diagram printed on the margin of the map.	— —	— —
4. Oriented the map.	— —	— —
5. Corrected the orientations of the map when the G-M angle exceeded 3 degrees (50 mils) using one of the following methods: **a.** Formed the G-M angle with the black index line and the needle on the compass. **b.** Used the pivot point "P" on the south neat line and the degrees of arc along the north neat line; placed the compass along this line. **c.** Drew a magnetic north line from any N-S and E-W grid line intersection using a protractor and placed the compass along this line. ***Note:*** Steps 5 were only required when the G-M angle was greater than 3 degrees or 50 mils. Step 5b was only tested if the map had the built-in protractor.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26

071-329-1003
Determine a Magnetic Azimuth Using a Lensatic Compass

Conditions: Given a compass and a designated point on the ground.

Standards: Determine the correct magnetic azimuth to the designated point within 3 degrees using the compass-to-cheek method, and within 10 degrees using the center-hold method.

Performance Steps

1. Inspect the compass (figure 071-329-1003-1).

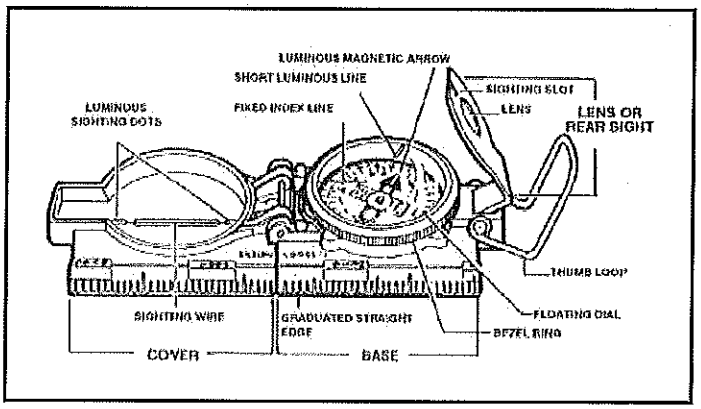


Figure 071-329-1003-1. Lensatic compass

a. Ensure floating dial, which contains the magnetic needle, moves without restraint and does not stick.

b. Ensure the sighting wire is straight.

c. Ensure glass and crystal parts are not broken.

d. Ensure numbers on the dial are readable.

2. Determine direction (figure 071-329-1003-2).

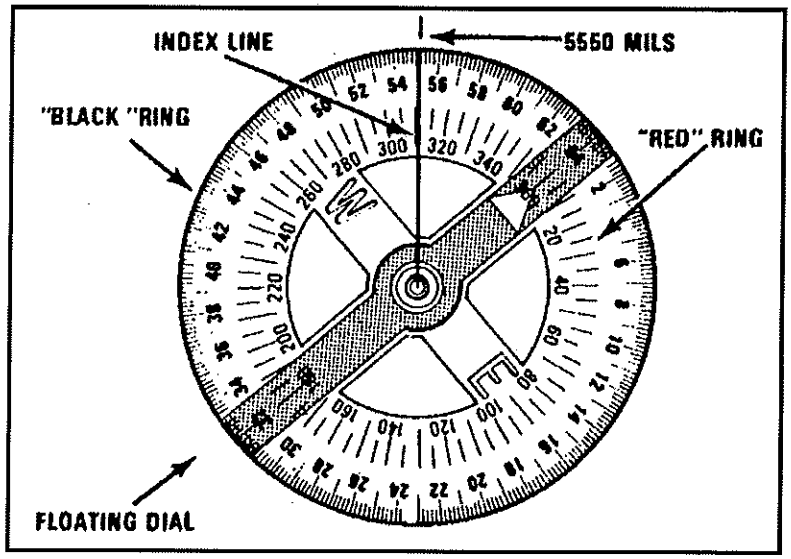


Figure 071-329-1003-2. Lensatic compass floating dial

a. Align the compass to the direction you want to go or want to determine.

b. Locate the scale beneath the index line on the outer glass cover.

c. Determine to the nearest degree, or 10 mils, the position of the index line over the red or black scale.

Performance Steps

Note: Effects of Metal and Electricity. Metal objects and electrical sources can affect the performance of a compass. However, nonmagnetic metals and alloys do not affect compass readings. The following separation distances are suggested to ensure proper functioning of a compass:

High-tension power lines ..... 55 meters.
Field gun, truck, or tank..... 18 meters.
Telegraph or telephone wires and barbed wire..... 10 meters.
Machine gun..... 2 meters.
Steel helmet or rifle..... 1/2 meter.

3. Determine an azimuth with the compass-to-cheek method (figure 071-329-1003-3).

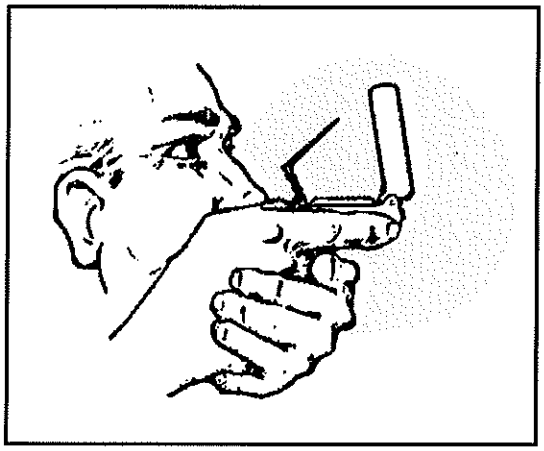


Figure 071-329-1003-3. Compass-to-cheek method

a. Open the clover to a 90-degree angle to the base.
b. Position the eyepiece at a 45-degree angle to the base.
c. Place your thumb through the thumb loop.
d. Establish a steady base with your third and fourth fingers.
e. Extend your index finger along the side of the compass base.
f. Place the hand holding the compass into the palm of the other hand.
g. Move both hands up to your face.
h. Position the thumb that is through the thumb loop against the cheekbone.

Note: If the dial is not in focus, move the eyepiece up or down until the dial is in focus.

i. Align the sighting slot of the eyepiece with the sighting wire in the cover on the desired point.
j. Read the azimuth under the index line.

Note: If the dial is not in focus, move the eyepiece up or down until the dial is in focus.

Performance Steps

4. Determine an azimuth with the center-hold method (figure 071-329-1003-4).

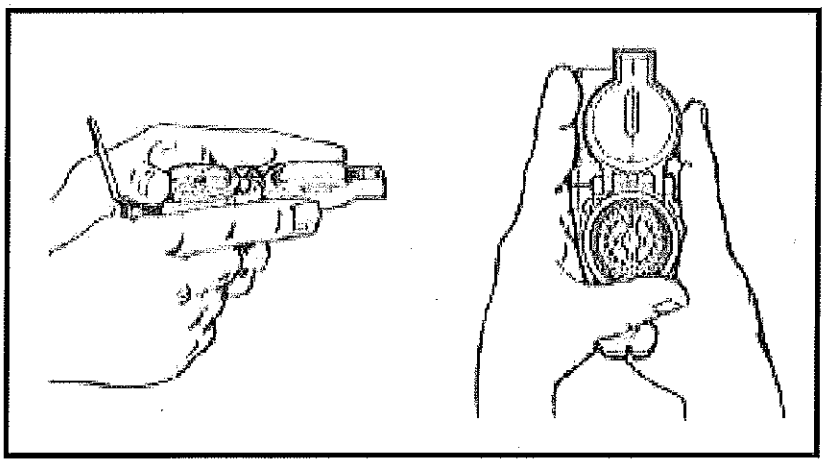


Figure 071-329-1003-4. Centerhold technique

Note: This method offers the following advantages over the sighting technique:
- It is faster and easier to use.
- It can be used under all conditions of visibility.
- It can be used when navigating over any type of terrain.
- It can be used without putting down the rifle; however, the rifle must be slung well back over either shoulder.
-It can be used without removing eyeglasses.

a. Open the compass so that the cover forms a straight edge with the base.
b. Position the eyepiece lens to the full upright position.
c. Place your thumb through the loop.
d. Establish a steady base with your third and fourth fingers.
e. Extend your index finger along the side of the compass.
f. Place the thumb of your other hand between the eyepiece and lens.
g. Extend the index finger along the remaining side of the compass.
h. Secure the remaining fingers around the fingers of the other hand.
i. Place your elbows hard into your side.
Note: This will place the compass between your chin and your belt.
k. Align the compass cover straight at the object.
l. Read the azimuth from beneath the fixed black index line.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Inspected the compass.	— —	— —
2. Determined direction.	— —	— —
3. Determined an azimuth using the compass-to-cheek method.	— —	— —
4. Determined an azimuth using the center-hold method.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26

Performance Measures	GO	NO GO
1. Identified the five major terrain features.	— —	— —
2. Identified the three minor terrain features.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26

071-329-1008
Measure Distance on a Map

Conditions: Given a 1:50,000-scale military map, a strip of paper with a straight edge, and a pencil.

Standards: Determine the straight-line distance between two points in meters, with no more than 5-percent error and the road (curved line) distance between two points in meters, with no more than 10-percent error.

Performance Steps

1. Identify the scale of the map.
2. Convert a straight-line map distance to miles, meters, or yards using the map's bar scale for map distances equal to or less than 1 inch (figure 071-329-1008-1).

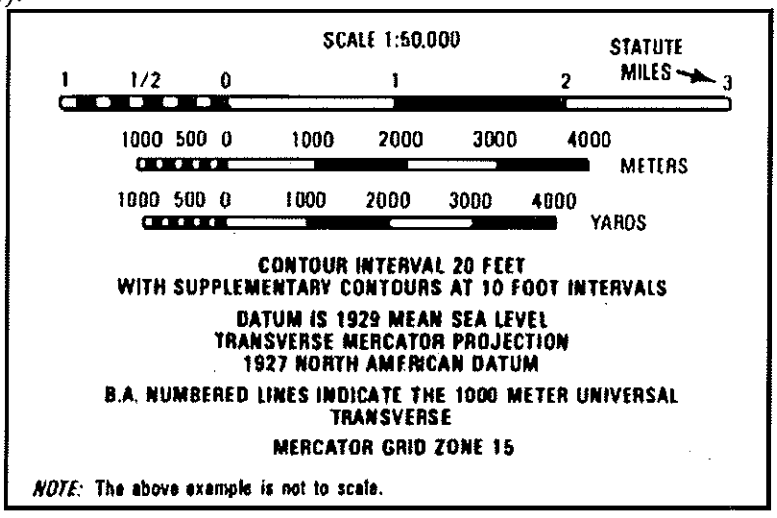


Figure 071-329-1008-1. Map bar scales

a. Align the edge of a strip of paper with the beginning and ending points on the map.

b. Mark on the straight edge of the paper the beginning and ending points (figure 071-329-1008-2).

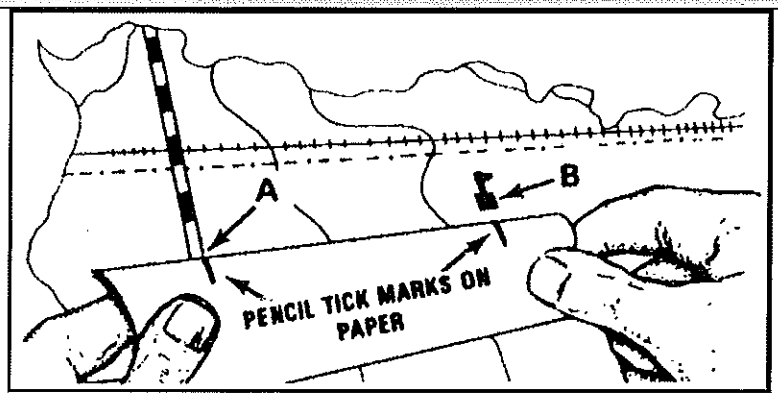


Figure 071-329-1008-2. Beginning and ending points

c. Align the marks on the paper with the appropriate bar scale (figure 071-329-1008-3).

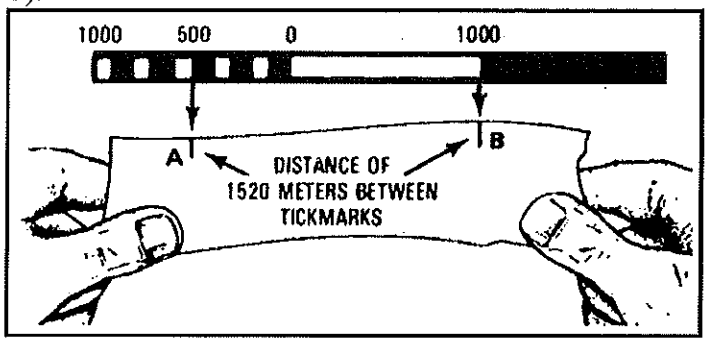


Figure 071-329-1008-3. Distance between beginning and ending points

d. Determine the distance on the scale that compares to the distance on the paper.

3. Convert a straight-line map distance to miles, meters, or yards using the map's bar scale for map distances greater than 1 inch.

a. Line up the straight edge of a strip of paper with the beginning and ending points on the map.

b. Mark the beginning and ending points on the straight edge of the paper (figure 071-329-1008-4).

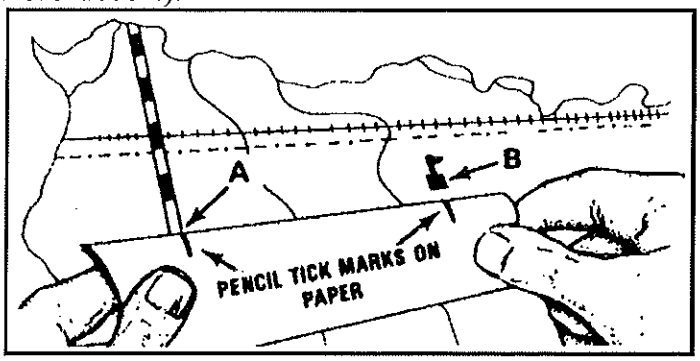


Figure 071-329-1008-4. Beginning and ending points

c. Place the starting point on the paper under the zero on the bar scale.

d. Measure off 4,000 meters and place a new tick mark on the paper.

e. Place the new tick mark under the zero on the bar scale.

f. Determine if the end point falls within the bar scale.

(1) Record the value on the scale of the end-point if the end-point fits on the scale.

(2) Add 4,000 meters to this value (a) to get the total difference.

g. Determine if the end-point falls outside the bar.

(1) Repeat steps 3d and 3e until the end-point falls within the bar.

(2) Add 4,000 meters to the value you derived in step 3f(1) for each time you performed step 3d to achieve the total distance.

4. Convert a road map distance to miles, meters, or yards using the map's bar scale for distances equal to or less than 1 inch.

a. Align the edge of a strip of paper with the beginning point and the point where the road makes the first curve on the map.

b. Mark on the straight edge of the paper the beginning and curve points.

c. Repeat steps 4a and b, each time using the point of the curve as the next beginning point, until you reach the end-point.

d. Align the marks on the paper with the appropriate bar scale (figure 071-329-1008-5).

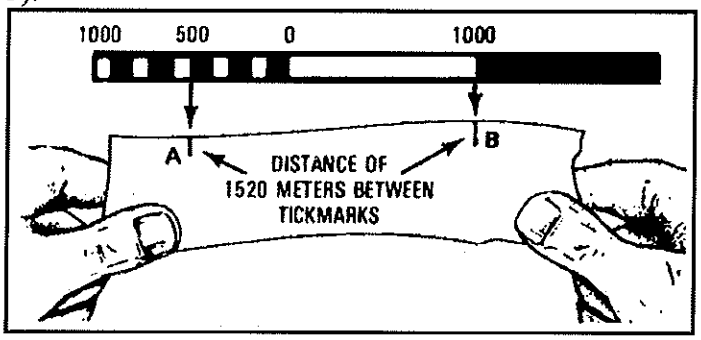


Figure 071-329-1008-5. Distance between beginning and ending points

e. Determine the distance on the scale that compares to the distance on the paper.

5. Convert a road map distance to miles, meters or yards using the map's bar scale for distances greater than 1 inch.

a. Align the edge of a strip of paper with the beginning point and the point where the road makes the first curve on the map.

b. Mark on the straight edge of the paper the beginning and curve points.

c. Repeat steps 5a and b, each time using the point of the curve as the next beginning point, until you reach the end-point.

d. Place the starting point on the paper under the zero on the bar scale.

e. Measure off 4,000 meters and place a new tick mark on the paper.

f. Place the new tick mark under the zero on the bar scale.

Performance Steps

g. Determine if the end-point falls within the bar scale.

(1) Record the value on the scale of the end-point if the end-point fits on the scale.

(2) Add 4,000 meters to this value (a) to get the total difference.

h. Determine if the end-point falls outside the bar.

(1) Repeat steps 5d and 5e until the end-point falls within the bar.

(2) Add 4,000 meters to the value you derived in step 5g(1) for each time you performed step 5d to achieve the total distance.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Identified the scale of the map.	— —	— —
2. Converted a straight-line map distance to miles, meters, or yards using the map's bar scale for map distances equal to or less than 1 inch.	— —	— —
3. Converted a straight-line map distance to miles, meters, or yards using the map's bar scale for map distances greater than 1 inch.	— —	— —
4. Converted a road map distance to miles, meters, or yards using the map's bar scale for distances equal to or less than 1 inch.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26

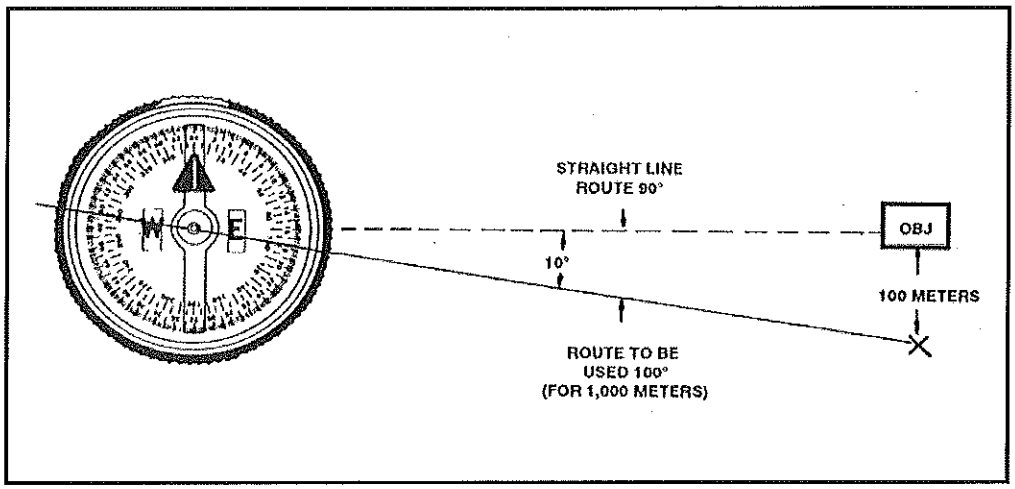


Figure 9-6. Deliberate offset to the objective.

9-5. FIELD-EXPEDIENT METHODS

When a compass is not available, different techniques may be used to determine the four cardinal directions.

a. **Shadow-Tip Method.** This simple and accurate method of finding direction by the sun consists of four basic steps (Figure 9-7).

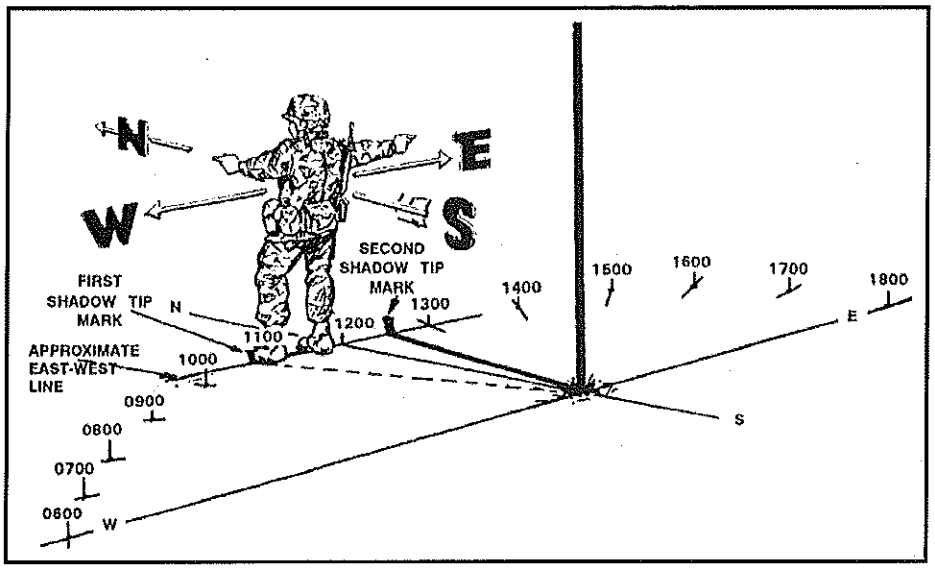


Figure 9-7. Determining directions and time by shadow.

Step 1. Place a stick or branch into the ground at a level spot where a distinctive shadow will be cast. Mark the shadow tip with a stone, twig, or other means. This first shadow mark is always the west direction.

Step 2. Wait 10 to 15 minutes until the shadow tip moves a few inches. Mark the new position of the shadow tip in the same way as the first.

Step 3. Draw a straight line through the two marks to obtain an approximate east-west line.

Step 4. Standing with the first mark (west) to your left, the other directions are simple; north is to the front, east is to the right, and south is behind you.

(1) A line drawn perpendicular to the east-west line at any point is the approximate north-south line. If you are uncertain which direction is east and which is west, observe this simple rule—the first shadow-tip mark is always in the west direction, everywhere on earth.

(2) The shadow-tip method can also be used as a shadow clock to find the approximate time of day (Figure 9-7).

(a) To find the time of day, move the stick to the intersection of the east-west line and the north-south line, and set it vertically in the ground. The west part of the east-west line indicates 0600 hours, and the east part is 1800 hours, anywhere on earth, because the basic rule always applies.

(b) The north-south line now becomes the noon line. The shadow of the stick is an hour hand in the shadow clock, and with it you can estimate the time using the noon line and the 6 o'clock line as your guides. Depending on your location and the season, the shadow may move either clockwise or counterclockwise, but this does not alter your manner of reading the shadow clock.

(c) The shadow clock is not a timepiece in the ordinary sense. It makes every day 12 unequal hours long, and always reads 0600 hours at sunrise and 1800 hours at sunset. The shadow clock time is closest to conventional clock time at midday, but the spacing of the other hours compared to conventional time varies somewhat with the locality and the date. However, it does provide a satisfactory means of telling time in the absence of properly set watches.

(d) The shadow-tip system is not intended for use in polar regions, which the Department of Defense defines as being above 60 degrees latitude in either hemisphere. Distressed persons in these areas are advised to stay in one place so that search/rescue teams can easily find them. The presence and location of all aircraft and ground parties in polar regions are reported to and checked regularly by governmental or other agencies, and any need for help becomes quickly known.

b. **Watch Method.** A watch can be used to determine the approximate true north and true south.

(1) In the north temperate zone only, the hour hand is pointed toward the sun. A south line can be found midway between the hour hand and 1200 hours, standard time. If on daylight savings time, the north-south line is found between the hour hand and 1300 hours. If there is any doubt as to which end of the line is north, remember that the sun is in the east before noon and in the west after noon.

(2) The watch may also be used to determine direction in the south temperate zone; however, the method is different. The 1200-hour dial is pointed toward the sun, and halfway between 1200 hours and the hour hand will be a north line. If on daylight savings time, the north line lies midway between the hour hand and 1300 hours (Figure 9-8).

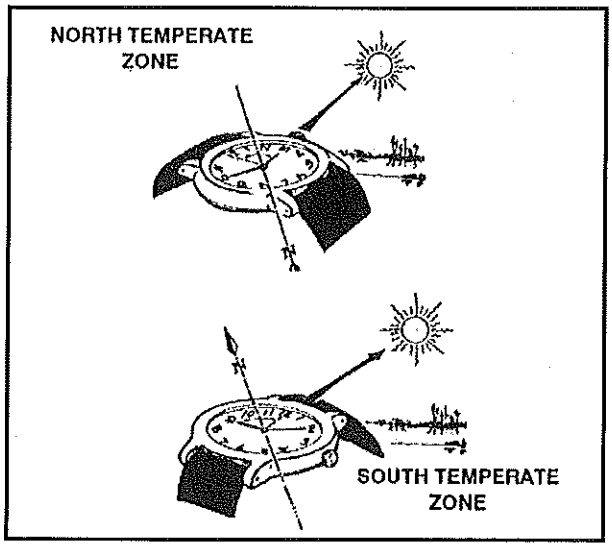


Figure 9-8. Determining direction using a watch.

(3) The watch method can be in error, especially in the lower latitudes, and may cause *circling*. To avoid this, make a shadow clock and set your watch to the time indicated. After traveling for an hour, take another shadow-clock reading. Reset your watch if necessary.

c. **Star Method.** Less than 60 of about 5,000 stars visible to the eye are used by navigators. The stars seen as we look up at the sky at night are not evenly scattered across the whole sky. Instead they are in groups called constellations.

(1) The constellations that we see depends partly on where we are located on the earth, the time of the year, and the time of the night. The night changes with the seasons because of the journey of the earth around the sun, and it also changes from hour to hour because the turning of the earth makes some constellations seem to travel in a circle. But there is one star that is in almost exactly the same place in the sky all night long every night. It is the North Star, also known as the Polar Star or Polaris.

(a) The North Star is less than 1 degree off true north and does not move from its place because the axis of the earth is pointed toward it. The North Star is in the group of stars called the Little Dipper. It is the last star in the handle of the dipper. There are two stars in the Big Dipper, which are a big help when trying to find the North Star. They are called the Pointers, and an imaginary line drawn through them five times their distance points to the North Star.

(b) Many stars are brighter than the North Star, but none is more important because of its location. However, the North Star can only be seen in the northern hemisphere so it cannot serve as a guide south of the equator. The farther one goes north, the higher the North Star is in the sky, and above latitude 70 degrees, it is too high in the sky to be useful (Figure 9-9, page 9-10).

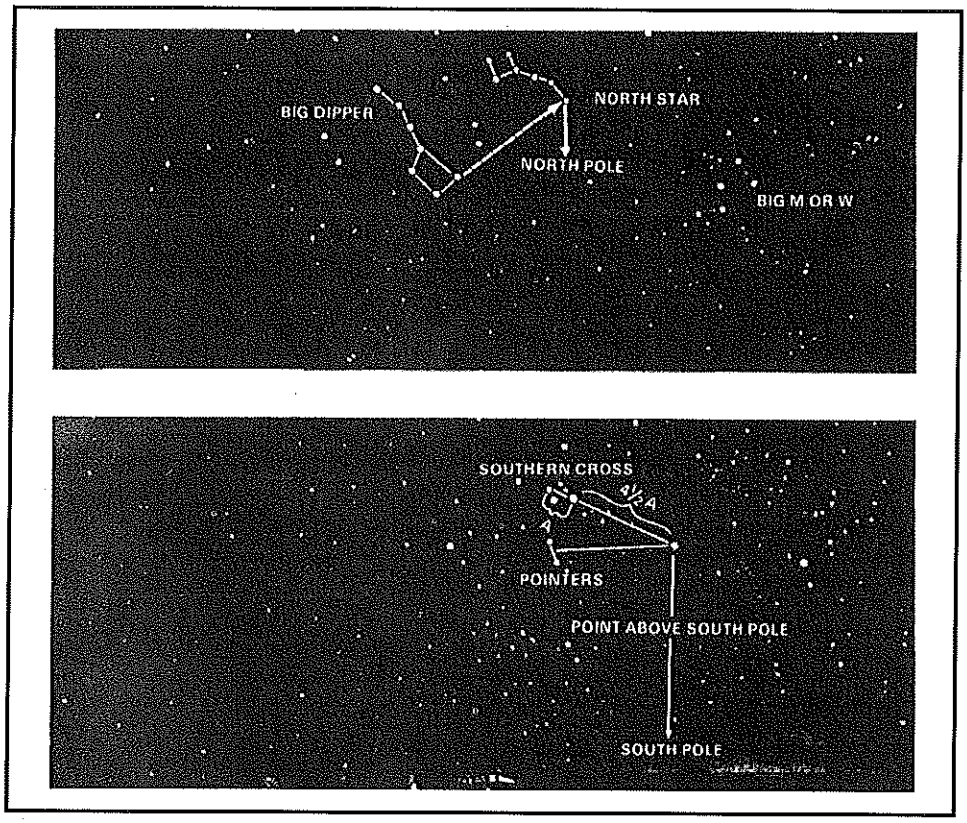


Figure 9-9. Determining direction by the North Star and Southern Cross.

(2) Depending on the star selected for navigation, azimuth checks are necessary. A star near the north horizon serves for about half an hour. When moving south, azimuth checks should be made every 15 minutes. When traveling east or west, the difficulty of staying on azimuth is caused more by the likelihood of the star climbing too high in the sky or losing itself behind the western horizon than it is by the star changing direction angle. When this happens, it is necessary to change to another guide star. The Southern Cross is the main constellation used as a guide south of the equator, and the general directions for using north and south stars are reversed. When navigating using the stars as guides, the user must know the different constellation shapes and their locations throughout the world (Figure 9-10 and Figure 9-11 on page 9-12).

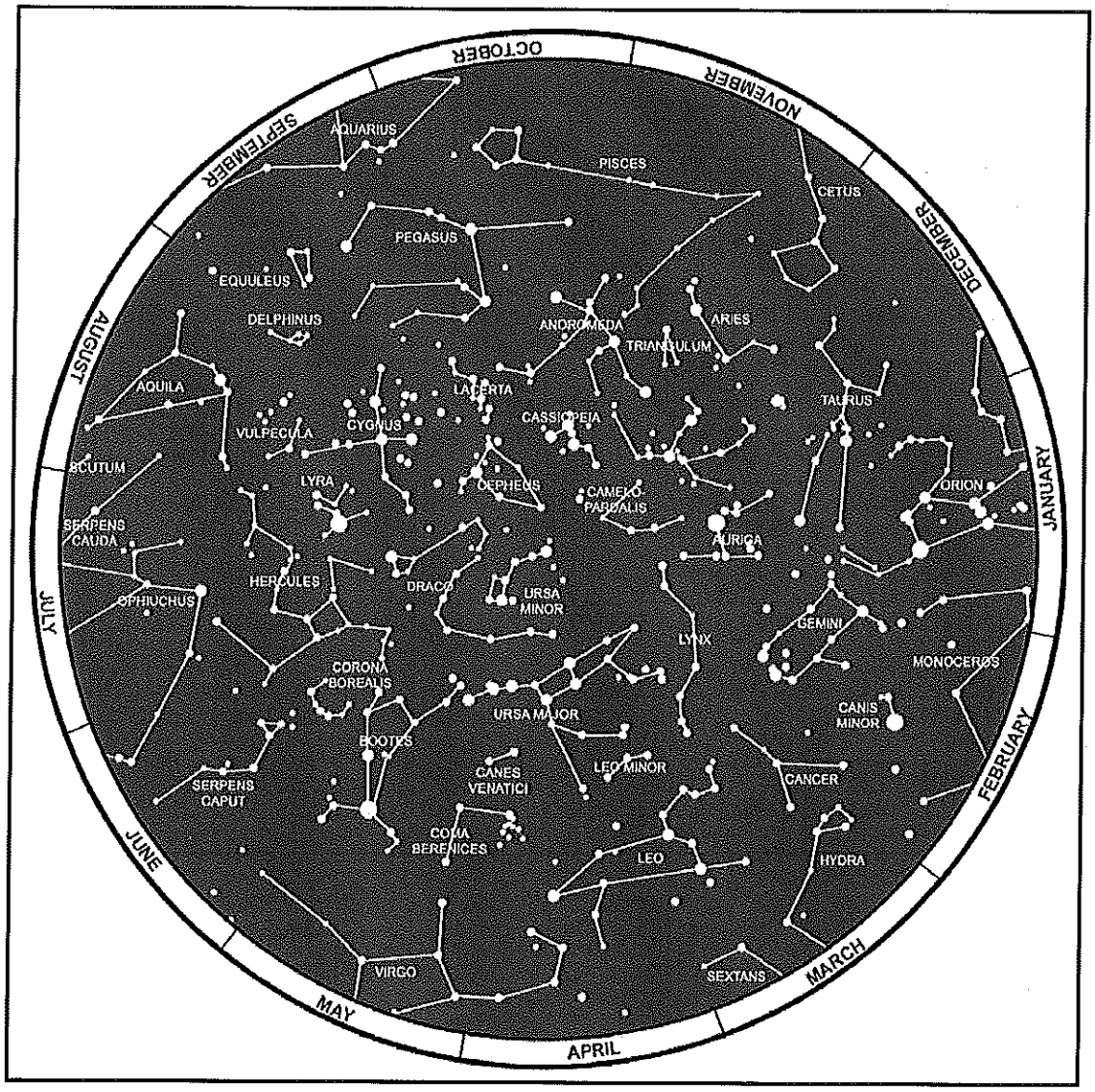


Figure 9-10. Constellations, northern hemisphere.

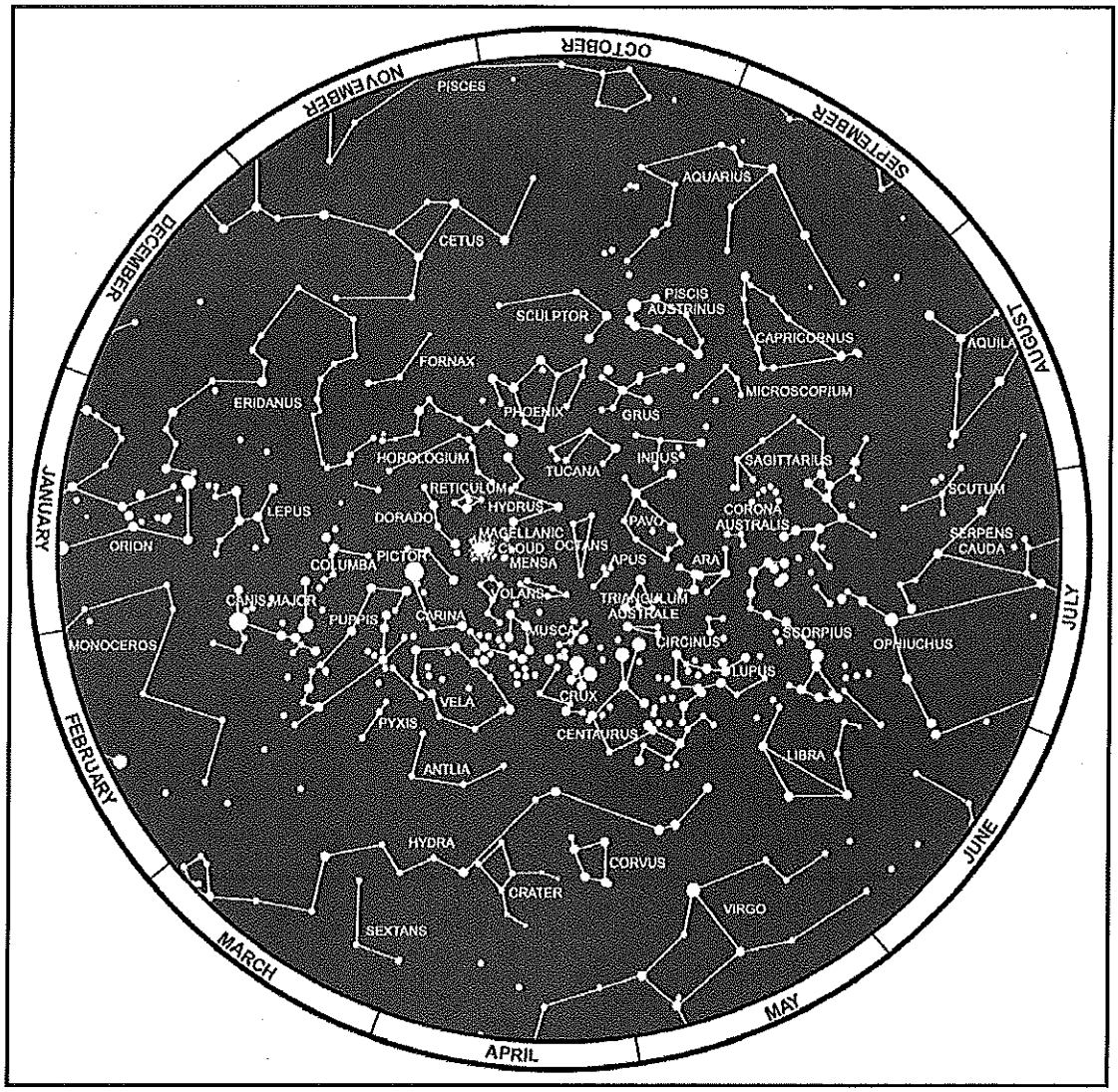


Figure 9-11. Constellations, southern hemisphere.

Quiz 2

Quiz 2

Complete the quiz below. When you finish, check your answers with the answer key in the back of this RTP. Review any questions you missed or are not sure of to ensure understanding of this lesson.

This evening, or on the next clear evening in your location, go outside. Trying to stay away from lighted areas, find the Big Dipper, and the north Star.

Question 1 When using the shadow-tip method to determine direction, where on the shadow do you place the object (stone, stick, coin, etc.)?

Question 2 When you place an object (stone, stick, coin, etc.) to mark your first shadow, which directional setting have you made?

Question 3 What line do you create by drawing a line from the first shadow mark to the second shadow mark?

Question 4 If you draw a perpendicular line anywhere on the approximate east-west line, what line have you made?

Question 5 Once you establish your approximate east-west line using the shadow-tip method, how do you position yourself on the line to determine north, south, east, and west?

Question 6 In the northern temperate zone, what part of the watch do you point toward the sun?

Question 7 What is the difference between determining direction in the northern temperate zone during daylight saving time and standard time?

Question 8 Which two stars on the Big Dipper point to the North Star and what are they called?

Question 9 How far out from the Big Dipper do you draw an imaginary line to the North Star?

Question 10 When you have found the North Star, which north have you found? (Circle one.)

a. True North.
b. Grid North.
c. Magnetic North.
d. Zodiacal North.

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required: GTA 05-02-012
Related: FM 3-25.26

071-329-1012
Orient a Map to the Ground by Map-Terrain Association

Conditions: Given a standard 1:50,000-scale military map of the area, and a requirement to orient the map.

Standards: Orient the map to within 30 degrees of magnetic north.

Performance Steps

1. Hold the map in a horizontal position.
2. Match terrain features appearing on your map with terrain features you can see on the ground (figure 071-329-1012-1).

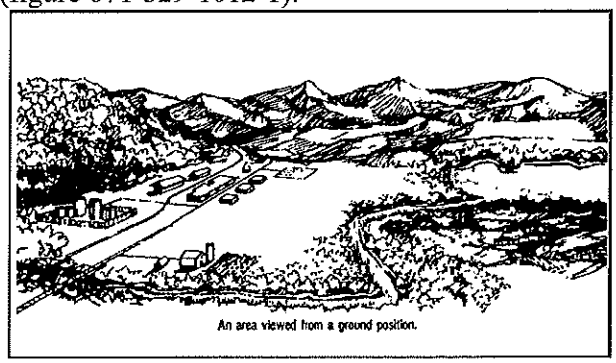


Figure 071-329-1012-1. Features used to orient map

3. Align the map such that the terrain features on the map line up with the terrain features on the ground.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Held the map in a horizontal position.	— —	— —
2. Matched terrain features appearing on map with physical features on the ground.	— —	— —
3. Aligned the map such that the terrain features appearing on map lined up with the physical features on the ground to within 30 degrees.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required: GTA 05-02-012
Related: FM 3-25.26

071-329-1012
Orient a Map to the Ground by Map-Terrain Association

Conditions: Given a standard 1:50,000-scale military map of the area, and a requirement to orient the map.

Standards: Orient the map to within 30 degrees of magnetic north.

Performance Steps

1. Hold the map in a horizontal position.
2. Match terrain features appearing on your map with terrain features you can see on the ground (figure 071-329-1012-1).

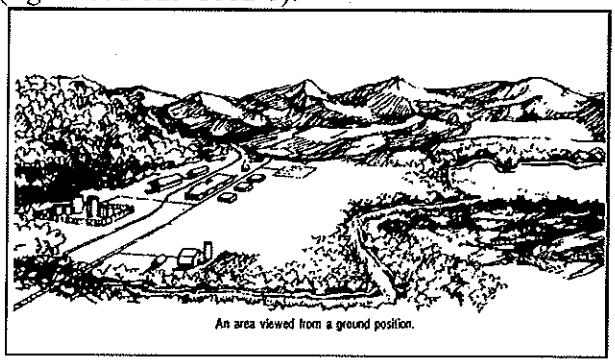


Figure 071-329-1012-1. Features used to orient map

3. Align the map such that the terrain features on the map line up with the terrain features on the ground.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Held the map in a horizontal position.	— —	— —
2. Matched terrain features appearing on map with physical features on the ground.	— —	— —
3. Aligned the map such that the terrain features appearing on map lined up with the physical features on the ground to within 30 degrees.	— —	— —

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

Performance Steps

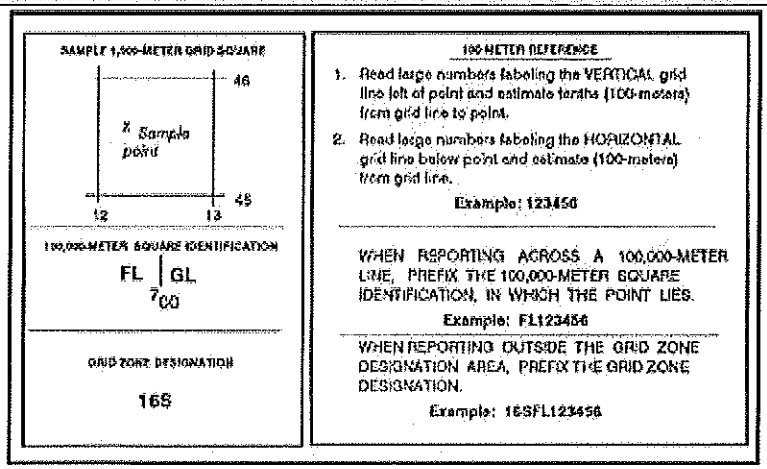


Figure 071-329-1002-7. Grid reference box

b. Place the 100,000-meter-square identifier in front of the grid coordinate.

Note: In the example given the final grid coordinate becomes GL115813.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Determined the coordinates of the grid square.	——	——
2. Determined point grid coordinates without coordinate scale.	——	——
3. Determined point grid coordinates with coordinate scale.	——	——
4. Added the two-letter 100,000-meter-square identifier to the determined grid coordinate.	——	——

Evaluation Guidance: Refer to chapter 1, paragraph 1-9e, (1) and (2).

References
Required:
Related: FM 3-25.26 and GTA 05-02-012

071-329-1005
Determine a Location on the Ground by Terrain Association

Conditions: Given a standard 1:50,000-scale military map of the area, pencil, paper, a coordinate scale, compass and a requirement to determine a location on the ground by terrain association.

Standards: Determine the coordinates of the identified location within 100 meter.

Performance Steps

1. Identify the location to be determined.

Note: In general, terrain association is used to determine an individual's current physical location; however, terrain association maybe used to determine any location that is identifiable on the map.

2. Point the weapon in a safe direction.

Note: There are two ways to orient a map: (1) Using a compass. The magnetic arrow of the compass points to magnetic north. As such, pay special attention to the declination diagram. (2) Using terrain association. This method is, as a rule, used when a compass is not available or when the user has to make many quick references as he moves across country.

3. Determine the type of terrain feature on which you are located (or the identified location).

4. Determine the types of terrain features that surround your location (or the identified location).

5. Correlate the terrain features on the ground to those shown on the map.

6. Determine your location.

7. Determine the coordinates of your location.

Note: Determine your location using a coordinate scale and protractor, a plotting scale, or by visualizing a 10 by 10 grid box inside the appropriate grid square.

Evaluation Preparation: *Setup:* Provide the Soldier with the equipment and/or materials described in the conditions statement.
Brief Soldier: Tell the Soldier what is expected of him by reviewing the task standards. Stress the importance of observing all cautions, warnings, and dangers to avoid injury to personnel and, if applicable, damage to equipment.

Performance Measures	GO	NO GO
1. Identified the location to be determined.	— —	— —
2. Oriented the map.	— —	— —
3. Determined the type of terrain feature on which you were located (or the identified location).	— —	— —
4. Determined the types of terrain features that surround your location (or the identified location).	— —	— —
5. Correlated the terrain features on the ground to those shown on the map.	— —	— —
6. Determined location.	— —	— —
7. Determined the coordinates of your location.	— —	— —

Quiz 1 Solution Sheet

Question 1

1-Black. 2-Blue. 3-Brown. 4-Green. 5-Red. 6-Red-Brown.

Ref: Page RTP-4

Question 2

1. Black: Cultural (man-made) features other than roads.
2. Blue: Water.
3. Brown: All relief features--contour lines on old maps--cultivated land on red-light readable maps.
4. Green: Vegetation.
5. Red: Major roads, built-up areas, special features on old maps.
6. Red-Brown: All relief features and main roads on red-light readable maps.

Ref: Page RTP-4

Question 3

In the **LEGEND**, located in the **LOWER LEFT MARGIN**.

Ref: Pages RTP-6 and RTP-7.

Question 4

The declination diagram.

Ref: Page RTP-6.

Question 5

Lower Margin of large-scale maps.

Ref: Page RTP-7.

Question 6

... more precise ...

Ref: Page RTP-19.

Question 7

1,000 meters.

Ref: Page RTP-19.

Question 8

Left to right, then up.

Ref: Page RTP-21.

Question 9

Six-digits

Ref: Page RTP-21.

Question 10

1. Hill	3. Ridge	5. Depression	7. Spur
2. Valley	4. Saddle	6. Draw	8. Cliff

Ref: Pages RTP-12 thru RTP-16

Quiz 2 Solution Sheet

Question 1	At the tip of the shadow. Ref: Page RTP-34.
Question 2	West. Ref: Page RTP-34.
Question 3	The approximate east-west line. Ref: Page RTP-35.
Question 4	The approximate north-south line. Ref: Page RTP-35.
Question 5	Stand with the first mark (west) to your left, meaning you are facing north, east is to the right and south to the rear. Ref: Page RTP-35.
Question 6	The hour hand. Ref: Page RTP-35.
Question 7	For standard time, south is half way between the hour hand and 1200 hours. For daylight saving time, south is half way between the hour hand and 1300 hours. Ref: Page RTP-35.
Question 8	The two stars that form the outer lip of the dipper. We call them **pointer stars**. Ref: Page RTP-36.
Question 9	A distance approximately five times the distance between the pointer stars. Ref: Page RTP-36.
Question 10	a. True north. Ref: Page RTP-36.